

# ALASTRIM; OR, KAFFIR MILK POX

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## PLATES III-VII

For some months before my arrival in the Colony an epidemic of an eruptive fever described as Alastrim, or Kaffir Milk Pox, broke out in Kingston, and from Kingston spread to the other parts of the Island. From about May, 1920, to the end of March, 1921, two thousand nine hundred and twelve cases have passed through the Isolation Hospital at Bumper Hall, Kingston, and about six thousand have occurred throughout the Island.

In the following paper I propose to consider:—

- I. The clinical aspect of the disease (p. 21);
- II. Its occurrence in the foetus (p. 29);
- III. Its relation to vaccination (p. 32);
- IV. Its morbid anatomy (p. 34).

### I. CLINICAL ASPECT

*Incubation period.* Owing to the difficulty of getting cases in which exposure occurred only once, and that for a short time, it has been impossible to determine the exact period of incubation; but in those in which I was able to get some definite history of exposure the incubation period varied from ten to about fourteen days.

The evidence on which this conclusion is based is as follows:—

CASE 1. A.H. Not vaccinated. He was in Kingston for three days during July when the epidemic was limited to Kingston only, and returned to his country district, where no cases had hitherto occurred. The symptoms developed 10 days after his return.

CASE 2. Photographer E. Not vaccinated. He attended with me at the Isolation Hospital and took his first set of photographs on July 20th, 1920. During this visit he placed his focussing cloth, before using it, on a chair which had been previously occupied by a patient. Ten days later he again took a photograph, and 3 days after the 2nd photograph he developed symptoms. He was positive

that these were the only two occasions on which he was exposed. Fortunately, his case proved to be mild in character.

CASE 3. Nurse at the Isolation Hospital. Not vaccinated. She complained of headache and pain in the back 14 days after she took up duty. So far as she knows she had not previously been exposed. The disease ran its usual course. This case had been exposed to infection several times before symptoms developed and is only useful as determining the upper limit of the incubation period.

CASE 4. A boy at school in Kingston. He developed symptoms at Annotto Bay 11 days after leaving his school in Kingston. He stated that a number of cases of Alastrim had occurred at his school, but he did not know when he had himself been exposed to infection. He was the first case which occurred in Annotto Bay, and like Case 1, was directly traceable to Kingston.

The remaining cases are not so definite.

CASES 5-7. During their stay at the Isolation Hospital a number of pregnant women suffering from Alastrim gave birth to children. Three of these cases I saw. The infants at birth were free of all signs of the disease. They were breast-fed by their mothers, and the rashes appeared on the 10th, 11th, and 12th days after birth respectively.

Not much weight can be attached to this evidence because intra-uterine infection could not definitely be excluded. I say this because later on in this paper I shall instance such cases in which infants were born with the rash well developed.

Failing more definite evidence, the period of incubation can therefore be placed provisionally at from ten to fourteen days.

*Onset.* The onset of the disease is sudden. There is a rise of temperature accompanied by headache and backache, and occasionally pains in the limbs and vomiting. The rise of temperature was constant.

Of two hundred and two cases of both sexes (one hundred and thirty-three males and sixty-nine females), the incidence of the various symptoms of onset were as follows:—

Headache ...	...	172 cases, or about 85 per cent.
Backache ...	...	111 ,, ,, ,, 54 ,,
Pain in limbs ...	...	41 ,, ,, ,, 25 ,,
Vomiting ...	...	32 ,, ,, ,, 16 ,,

The headache, when present, was generally severe, and often either frontal or vertical.

Of the one hundred and eleven cases in which backache occurred, only forty-five described their pain as severe; the remaining sixty-six described it as moderate. Backache was relatively far more frequent

among the women than among the men; 70 per cent. of the former complained as compared with only 45 per cent. of the latter, and twenty-seven of the forty-five severe cases were among the sixty-nine women. The greater incidence of backache among the women is probably due to the fact that many of them were victims of chronic endometritis, and magnified their usual backache symptoms.

The combination of headache, vomiting and pain in the back occurred in only twenty-one of the two hundred and two patients, and of these only six vomited more than once, and only one more than three times. In the majority of cases the tongue was furred and constipation was present.

*Other manifestations.* The characteristic eruption appeared with about equal frequency on the third or fourth day after the onset of the symptoms. The actual figures are as follows:—

In 21	cases	the	rash	occurred	on	the	2nd	day.
In 75	„	„	„	„	„	3rd	„	„
In 70	„	„	„	„	„	4th	„	„
In 36	„	„	„	„	„	5th	„	„

Either shortly before or after the appearance of the rash, the temperature falls and the constitutional symptoms disappear. The patient is then quite at ease until maturation begins, when for two or three days there is a great deal of pain from the tension under the skin. In a number of cases there is also secondary fever. No prodromal rashes were seen. Delirium was never observed. The deep depression which occurs at the onset of true smallpox was uniformly absent.

*Menstruation* did not appear in the women unless a period was due, and even then no one complained of more than her usual loss of blood.

*Odour.* There was an absence of odour such as is produced by smallpox. A few cases, however, developed a distinctly putrefactive smell, which was due to decomposing discharges.

*Pain in the throat and dysphagia,* accompanied in some cases by aphonia and enlargement of the glands of the neck, were noted as occurring in a number of cases. These symptoms were due to the presence of the eruption on the fauces, and presumably in the larynx and trachea.

*Sputum.* Three cases had bronchitic signs in the chest, and for a few days coughed up blood-stained sputum.

*Bowels.* In two cases there was profuse diarrhoea at the onset, but the majority were constipated.

*Urine.* In fifty cases whose urines were examined albuminuria was absent, unless due to some other cause, such as urethral or vaginal discharge. Unfortunately, no urines were obtained before the eruption appeared, and in none of the cases was the examination performed more than once. In one case of diabetes, the eruption ran the usual course, but was followed by a large number of boils.

*Eruption.* Patients do not usually come under observation until the rash is well developed; but in two cases which were admitted to the Isolation Hospital in the pre-eruptive stage the rash appeared in the form of small papules, which to the touch were superficially situated: the papules becoming vesicular in about thirty-six hours.

The vesicles are circular in shape, and when fully mature are from 4 to 5 mm. in diameter. The summit is either dome-shaped or flattened, and frequently shows a darkened central area. In the early stages the vesicles, if pricked, yield a clear serum quite free from cells, but polynuclear leucocytes begin to appear in the fluid on the second or third day, and gradually increase in numbers until turbid fluid, or even sometimes thick pus, is formed. At this stage the lesion is very tense, hard and shotty.

In the lighter coloured skins a definite red areola surrounds each pock. Primary umbilication is not often, if ever, seen, but on about the eighth or ninth day a secondary umbilication or flattening takes place, and is due to resorption of fluid.

The eruption is subject to variation, but, broadly speaking, two main types are distinguishable; the one type being finer and more closely set, and the other being larger and more distinct. Sometimes both types are found in the same patient, the vesicles then presenting a very unequal appearance.

The finer eruption has far less tendency to form thick pus, but the general course was similar to that of the larger variety.

A number of confluent and two haemorrhagic cases occurred in this series (altogether four cases of haemorrhagic rash have been brought to my notice, all occurring in women six to seven months pregnant, and all fatal).

*Distribution of the rash.* The rash makes its appearance or, at all events, is first noticed in certain positions. These are in order of frequency, the face, especially the forehead, and the dorsum of the wrist or forearm.

Of the two hundred and two cases, the location of the onset, as noticed by the patient, was as follows:—

Face ... ..	120
Wrist and forearm ... ..	52
Both arm and face ... ..	27
Scrotum ... ..	1
Inner side of knee ... ..	1
Elbow ... ..	1

Although in severer cases, as in Plate III, the whole body may be covered, the rash shows a predilection for certain areas. It especially tends to affect the face, the lower half of the back, and the arm and forearm, especially towards the wrists.

*Scalp.* The rash was present on the scalp in all the cases examined; the lesions, however, were often few in number.

*Mouth.* Pocks were frequently seen on the hard and soft palate, and to a less extent on the pillars of the fauces and the inside of the cheeks. In four cases the fraenum linguae was also affected.

*Larynx.* Hoarseness of voice and sometimes aphonia were present in the majority of the severe cases, and in a fair proportion of the other cases. Laryngoscopy was not possible, but in three of the cases pocks were present in the larynx and trachea—post-mortem.

*Palms and soles.* In all the two hundred and two cases pocks were seen on the palms and soles. In some these were abundant and caused much pain and discomfort. No lesions under the nails were noticed.

*Genitalia,* especially the prepuce, were often affected, and there was in a few cases much swelling and pain and difficulty of micturition.

Plates IV and V show that the rash is present on the area between the knee and the ankle. In true smallpox this area is described as being often free from rash.

The parts on which the distribution of the rash is often comparatively slight are:—

1. The neck.
2. The upper part of the trunk, and the abdomen.
3. The inner side of the thighs.
4. The circumorbital area.

In this latter situation there is frequently no rash at all, even in severe cases, though pocks are often seen on the edge of the lids. No pocks were seen on the conjunctiva.

The effect of irritation appears to be to determine a plentiful outcrop of rash (Plate V).

*The course.* The rash does not appear in crops, but it is often two or three days before the full extent of the eruption is obvious. The order in which it affects the various parts of the body is similar to that of true smallpox. After its appearance it gradually passes through the vesicular stage, already described, until it reaches maturity at about the sixth or seventh day. There is no tense shotty feeling until the rash is nearly matured.

This maturation is accompanied by oedema of the subcutaneous tissues. In the majority of cases this oedema is slight, but in others it is so great as sometimes completely to close the eyes. The oedema appears on the third or fourth day of the rash, reaching its height on the seventh or eighth day, and rapidly disappears (Plate VI).

Resorption of fluid begins to take place on about the eighth day, and convalescence is so rapid in many cases that by the twelfth day nearly all the scabs have fallen off the face. The rash disappears in the same order in which it appears, and in uncomplicated cases all the scabs have fallen at latest by the end of the third week.

In yet other cases the pigmentation is around the scar, the scar itself being achromic. In yet other cases, in fair skins there has been no subsequent pigmentation. In my opinion, the pigmentation is not of much import, in that the normal negro tends to deposit excess of pigment in and around scars. At first I thought that the pigmentation was the result of local treatment, but changed my mind when I saw the same thing in the scars of two infants born alive after intra-uterine alastrim.

*The Temperature.* The onset of the disease is marked by a rise of temperature, which may reach  $104^{\circ}$  or even  $105^{\circ}$ , but in most cases is about  $103^{\circ}$ . This temperature persists with but slight variations for three or four days, then rapidly falls to normal as the rash appears. Sometimes the fall of temperature completely

precedes the appearance of the rash, at other times both take place co-incidentally. The temperature then remains down for four or five days, to rise again as the rash matures. In mild cases there is no

CHART I.—Mild case of Alastrim. No secondary fever. Acute onset.

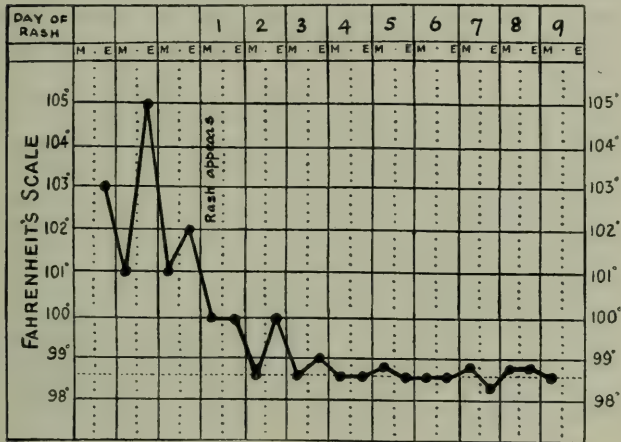
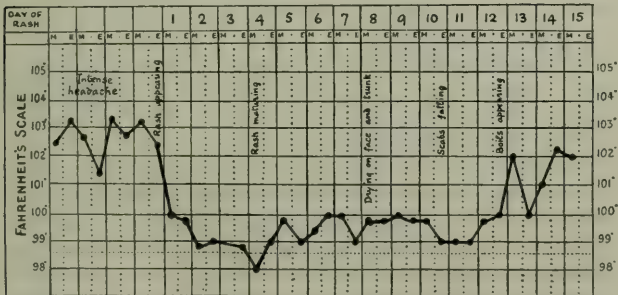


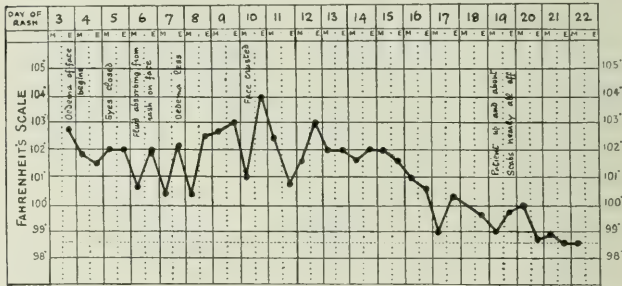
CHART II.—Medium case of Alastrim.



secondary rise of temperature, and in the severe cases the rise appears to be in some way dependent on the extent of the vesicles and the amount of infection with skin organisms. There is only a

slight rise when the pus is practically free from organisms, and a greater rise when there are many. In milder cases secondary fever is absent. A curious point about this secondary fever is that the patient is not conscious that he has a temperature, though his temperature may be as much as  $102^{\circ}$ . After persistence for a few days the temperature returns to normal, and stays there unless complications, such as boils, occur. The secondary fever is as a rule very mild.

CHART III.—Case of Alastrim exhibiting 'Typhoid' type of chart.



There is, however, another type of temperature which has been noted in a few of the very severe cases, and this approximates to the typhoid type, persisting for fourteen or fifteen days before falling to normal.

The temperature of onset is no indication of the severity of the disease, high temperatures being often succeeded by a scanty rash.

#### *Complications and Sequelae.*

*Broncho-pneumonia* is the most serious. It occurred in some of the fatal cases in which much rash was present in mouth and respiratory tract, and was probably due to aspiration of septic material.

*Laryngitis and aphonia* occur in the severer cases, but disappear as the rash disappears.

*Conjunctivitis* of a mild type develops in a number of cases, and is due to infection from the discharges of lesions on the eyelids.

*Impetigo.* Six cases developed impetigo when the rash was disappearing. In severe cases large areas of skin are apt to be



stripped off, leaving raw surfaces which are very painful and troublesome to treat.

*Boils* are the most frequent sequel. They appear at about the fifteenth day after the onset of the rash, and may persist for weeks.

*Eczema* of an intractable character of the external auditory meatus has also been noted.

*Prognosis* is good, except in the newly born and in the haemorrhagic type of rash.

Of two thousand nine hundred and twelve cases which have passed through the Isolation Hospital up to the end of March, 1921, there have been only thirteen deaths, an average of 4.5 per 1,000.

In eight of these cases the condition was as follows:—

Two women who were 6-7 months pregnant with a haemorrhagic rash. One bled profusely from nose and mouth, vagina and bowel; and both post-mortem showed internal haemorrhages.

One man who was 56 years old and died during convalescence.

One man who died after admission, but showed no signs of alastrim.

One man admitted in a dying condition. He had extensive confluent lesions with skin stripping and leaving large raw surfaces. He could hardly breathe. The mouth was very septic, and the smell from putrefying discharges was very offensive.

Three children all within the first month of life and manifesting the disease within the first fortnight of birth.

## II. OCCURRENCE IN THE FOETUS

The virus passes fairly readily through the placenta into the foetal circulation.

Up till February, 1921, of twenty cases admitted, after attacks of alastrim, to the Jubilee Maternity Hospital, eight cases of abortion at about the sixth month have occurred, and in each case the macerated foetus was marked with scars of the disease. Two of the cases I was able fully to investigate, and in these the abortion occurred eight weeks after the onset of the disease in the mother. All the organs were searched for spirochaetes without result, and the Wassermann reaction of the blood of the mothers was negative. The scars in the foetus were slightly depressed.

In addition, two children were born alive with marks of alastrim. The first child was born at full term with marks present as follows:—

Face ... ..	9 marks.
Trunk (front) ... ..	10 ,,
Trunk (back) ... ..	12 ,,
A few on each leg and arm.	
Two on each sole and one on each palm.	

These scars were depressed and surrounded by pigmentation. The mother of this child was alone in the world and developed eclampsia, and died soon after the birth of the child, so that it was impossible to obtain an accurate history. Scars and pigmentation such as occur after alastrim were, however, present on her body.

The second child was born at the seventh month and had no sign of disease on the face, but six spots on the left arm and seven on the right, with three on each leg. These scars were pigmented, as is the case in adults.

The mother's attack occurred eight and a half weeks previous to the birth of the child. The mother's Wassermann reaction was negative.

In none of these cases of foetal alastrim was the disease very severe in the mother, judging by the amount of scarring and pigmentation present.

The remaining ten labours yielded normal, full term children, two of which developed alastrim a day after labour. In addition, two remarkable cases have occurred in which mothers who had been vaccinated, who have never had alastrim, gave birth to children covered with an alastrim rash.

Both cases present a very similar history, save that one mother was vaccinated six weeks and the other four weeks before labour. I give the details of the second case.

'P.C.,' age 23. Sailed from Cuba, January 10th, for Jamaica; was vaccinated on the day of sailing. She landed in Jamaica January 12th, and had fever on 14th and 15th January. So far as she is aware she has never come into contact with any active cases of alastrim. On February 10th (day of examination) the scab had not yet fallen off her vaccination mark and covered an area a little larger than that of a threepenny-bit. She had no signs either in the way of scars or pigmentation of having had alastrim.

The child was born at full term with a pustular eruption (Plate VII), and died five days after birth. Mother and child gave negative Wassermann reactions.

These are cases either of generalised vaccinia occurring in utero

or of alastrim transmitted to the foetus by a mother rendered immune by vaccination. If they are cases of generalised vaccinia they demonstrate that ordinary vaccination can be so transmitted; if they are cases of alastrim, it would appear that just as the diphtheria bacillus grows readily in diphtheria antitoxin so the organism of alastrim can flourish in the blood of one who has, by vaccination, been rendered immune to its toxin, can retain its virulence, pass through the placenta and affect the foetus.

There is finally the possibility that the disease may have existed in the mother, but was so mild as to have been completely overlooked even by herself. If the incubation period be regarded as twelve days, and if the mother were infected on the twelfth day, the day of landing in Jamaica, she ought to have manifested symptoms on January 24th, at a time when, on general principles, she would have been completely protected by vaccination. The child at birth had a rash of at least five days' duration, and if another three days are allowed before the rash appears, must have been manifesting symptoms in utero by the 2nd February. If the child were infected twelve days previous to the manifestations of symptoms, the time relations would be about right. But as against this conclusion, the mother maintains that, apart from slight fever on the fourth and fifth days after vaccination, she was perfectly well. Moreover, I have not seen a mild case of alastrim in which there has not been some malaise. Of the three mildest cases which came under my notice one had four and two had two pocks each, yet in each of these cases the eruption, such as it was, was preceded by fever and malaise. Therefore, pending further evidence, I am of opinion that these cases illustrate the possibility of an immune mother transmitting the disease to her unborn child.

In connection with the question of foetal alastrim, I am impressed by the relatively high frequency with which it occurred among the cases of labour admitted to the Jubilee Hospital. Of twenty cases, ten produced alastrim foetuses, two produced infants developing the disease one day after birth, and only eight produced normal infants.

### III. ITS RELATION TO VACCINATION

The following two tables summarize the facts in two hundred and six adults and eighty children taken at random :—

ADULTS (206)

Cases		Mild	Medium	Severe
		%	%	%
With vaccination scars ... ..	72	47·2	30·5	22·2
Without vaccination scars ... ..	134	28·3	34·3	37·3
Total ... ..	206	35·0	33·0	32·0

CHILDREN (80)

Cases		Mild	Medium	Severe
		%	%	%
With vaccination scars ... ..	26	84·6	15·4	0·0
Without vaccination scars ... ..	54	44·4	25·9	29·6
Total ... ..	80	57·0	23·0	20·0

It will thus be seen that :—

1. There is a tendency to a mild type of case in children, due partly to vaccination and partly to some other factor.

2. No severe case occurred in the vaccinated children of this series, and twenty-two of the twenty-six (84·6 per cent.) vaccinated were mild cases.

Professor MacCallum and myself were continually exposed to infection for hours at a time, but never contracted the disease. We were both vaccinated, he recently and myself five years ago. One of the helpers at the Isolation Hospital was vaccinated by me before taking up duty. I frequently watched her handle the patients and

then either put her unwashed hands to her mouth, or wipe them in a handkerchief which she subsequently used to wipe her face. She never manifested any symptoms.

The Medical Officer of Health, Kingston, has vaccinated more than five hundred contacts, and he states that no cases of alastrim have occurred amongst them. I have vaccinated twenty contacts, and these were also completely protected.

On the other hand, five cases occurred in vaccinated infants, three in infants two years old, and two in infants four years old.

Goldsmith and Loughnan (1921) give clinical notes of three cases occurring in the vaccinated, three years, one and a half years and one year after successful vaccination.

*Re-vaccination after alastrim.*

Sixty cases were vaccinated by me during convalescence, the time of vaccination varying from the fifteenth day after the onset of the rash up to the twelfth week.

Of these, fifteen showed no sign of 'take' in two weeks, but twelve of these fifteen were subsequently vaccinated with three 'takes.' The method used was that of simple incision through the surface layers of the skin. Of the forty-five 'takes' none was typical as compared with normal controls vaccinated with the same batches of lymph.

*Course.* The incision healed over, and no sign of 'take' was visible before the seventh or eighth day, when a few papules were seen in the line of the incision. The papules increased but slowly in size, and by the fourteenth day were raised about 2 mm. above the surface of the arm. No induration or swelling of the arm was noticed, and in only a few cases was there adenitis, temperature, malaise or an areola more extensive than  $\frac{1}{2}$ -c.m. around the lesion, and even in these few cases the symptoms were hardly noticed. On pricking the early vesicles a small quantity of clear fluid was obtained. The lesion was multilocular, and on removing the top of the vesicles in a few cases it was seen that the base was composed of exuberant granulations rising up above the level of the skin, accounting for the fact that sometimes on pricking a small amount of blood came out with the fluid.

The scabs fell off in four weeks or more, and with one exception the resulting scar was not the depressed, pitted scar of typical

vaccinia, but on the contrary slightly raised (hypertrophy) above the surface, subsequently contracting to the level of the surface.

The points of difference between this and typical vaccinia appear to be:—

1. Tardy development and course of lesion.
2. Small size of vesicles and exuberant base and imperfect umbilication.
3. Insignificance of both local and constitutional reaction.
4. Resultant scar.

The evidence of the nature of vaccination after alastrim seem to show that vaccine lymph contains something else beside the factor which protects against alastrim, and it is this something else which gives the reaction after alastrim. The vaccine lymph on examination was found to contain a large amount of *Staphylococcus aureus*, an organism which is present in many specimens of calf lymph, and it may be this organism which causes the reaction, but the lesion produced did not suggest a septic process.

I inoculated four rabbits with the fluid from the vaccine lesion of one of the post alastrim cases, but the results were negative.

My opinion is that alastrim and vaccinia belong to the same group but present slight individual differences, the one disease affording almost complete immunity to the other.

#### IV. MORBID ANATOMY

CASE 1. Post-mortem performed 16 hours after death. Death took place on the 12th day of disease. Patient thickly covered with rash, which was confluent in parts and presented inequality of size of vesicles. Small petechial haemorrhage was seen on the sides of the abdomen. Patient was 6 months pregnant. She was admitted bleeding from nose, mouth, uterus. The mouth and throat were filled with a mass of necrotic material, and the entrance to the larynx and the vocal cords was similarly covered with necrotic material. The trachea contained pocks in its entire length. The right lung showed a haemorrhagic condition. There was a broncho-pneumonia with small spots of scattered haemorrhage visible on the cut surface of the lung. The left lung was apparently affected in the same manner, but to a less extent. The heart showed petechial haemorrhages under the epicardium, especially at the root of the aorta, and gross haemorrhage into the muscle substance of the left ventricle. Valves normal. The kidneys presented gross haemorrhage in the medulla and the pelvis was filled with blood. The bladder also showed haemorrhage under the mucous membrane, especially around the outlet. The liver was enlarged, but to the naked eye not obviously abnormal. Spleen not enlarged, firm. Stomach filled with 'coffee grounds' material,

petechiae present under mucous membrane. Intestines: colour dark red, with much haemorrhage and oedema. This condition affected the duodenum and first 3 feet of the jejunum. No lesion seen in the foetus.

CASE 2. Post-mortem six hours after death. Patient well covered with rash, which, on the face, was beginning to crust. Some confluence present on left side of abdomen. Patient 7 months pregnant. The throat was filled with necrotic material as also was the entrance to the larynx. Trachea showed the presence of pocks in its entire extent, and a similar condition obtained in the bronchi. Right lung showed some small haemorrhages and broncho-pneumonia. Left lung apparently normal. No haemorrhage into pleura or pericardium. Heart: A few spots of haemorrhage over the right ventricle under the epicardium. No gross haemorrhage into the substance of the muscle. Valves normal. Liver much enlarged and fatty. Spleen normal. Kidneys normal in size, but pale and fatty. Capsule stripped easily. No gross haemorrhage seen. Bladder normal. Uterus: A large subperitoneal haemorrhage on the right side just below the fallopian tube. Uterus contained a 7 months' foetus, which, on examination, showed a few sub-epicardial haemorrhages. Stomach normal. Intestines: The first 2 feet of the jejunum presented a remarkable condition; they were dark, haemorrhagic, and very oedematous. The whole lumen was in parts a solid mass.

CASE 3. Death on 11th day of rash. Scabbing on face and in upper part of chest. There were areas on the arms, abdomen, and particularly on the legs, in which absorption of the fluid in the vesicles was taking place leaving the vesicles lax. There were also large areas of confluent eruption about the size of half-a-crown on the outer portion of both legs, and on the sides of the abdomen. Some of the fluid from these areas was blood-stained. On other parts of the skin where the rash had been confluent the epidermis was stripping off leaving the surface raw. A putrid odour was observed. The trachea had small, ulcerated lesions extending down to the bronchi. The lungs were apparently normal except for a small portion of the upper lobe of the right lung. This appeared to be consolidated. Heart firmly contracted with somewhat excessive fat under the epicardium, otherwise normal. Aorta: Some athero-sclerosis. Liver large, somewhat congested, and on section looked like a nutmeg liver. Spleen smaller than normal, firm and fibrous. Kidney normal in size. Capsule stripped easily, substance rather pale, vessels more prominent than normal. Suprarenals normal. Bladder normal. Uterus: 2 small subserous fibroids. Intestines normal, but filled with a very large amount of faeces, especially the sigmoid and rectum.

CASE 4. Infant born with scabbing eruption; died 4 days after birth. General appearance normal save for eruption. Mouth, larynx, trachea normal. Lungs presented an unusual appearance; they were reddish-brown in colour, and on the surface was scattered small, white areas about 2 mm. in diameter. These areas extended for a short distance into the surface of the lung. The lungs were partially solid. Liver was dark red in colour and presented an appearance similar to that of the lung. Spleen apparently normal. Kidneys: There were small haemorrhages under the capsules and extending into the cortex. Suprarenals normal. Heart and circulatory system normal.

CASE 5. Infant born with alastrim. Mouth showed rash on the inside of the cheek. Larynx and trachea normal. Lungs and liver: condition similar to those of Case 4. Spleen and other organs normal.

*Inoculations.* Fluid was collected from the skin lesions of patients in various stages of the disease, and twenty-six rabbits and

four calves were inoculated by Professor MacCallum and myself. The skin was shaved and scarified, in some cases drawing blood, and the material was well rubbed in. These all gave negative results.

Blood from early cases and from a few patients who after contact with cases had developed headache and fever, but none of whom subsequently had an alastrim rash, was also used, but with negative results.

#### REFERENCE

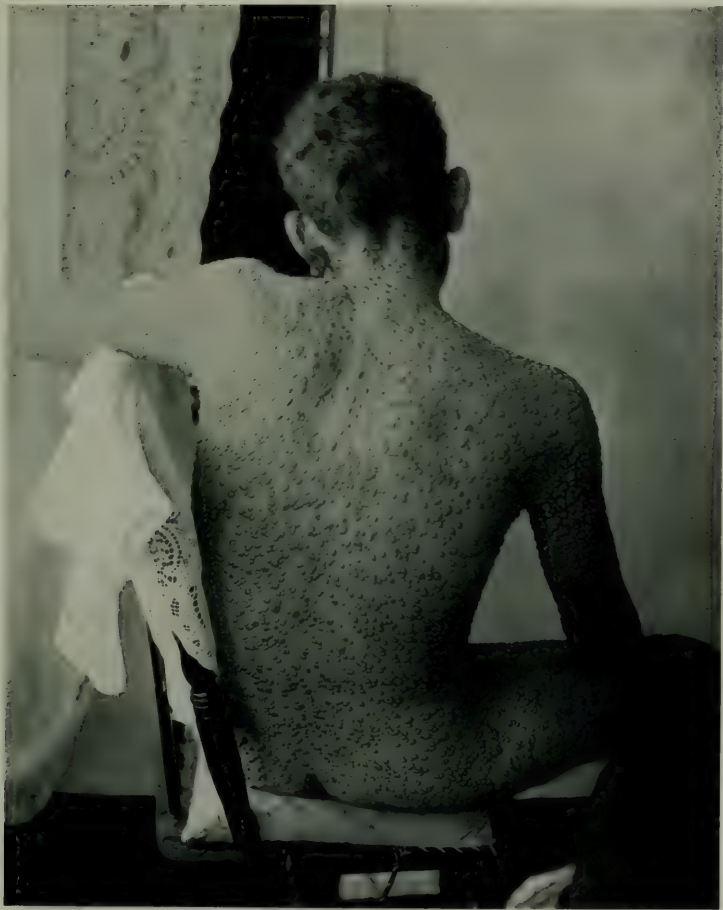
GOLDSMITH and LOUGHAN (1921). *Journ. R.A.M.C.*, Vol. XXXVI, p. 66.



## EXPLANATION OF PLATE III

Severe case. Patient vaccinated twelfth day after exposure to infection. Rash developed on eighteenth day and ran concurrently with vaccination. Some of the lesions show secondary umbilication due to resorption of fluid.

270



EXPLANATION OF PLATE IV

Showing distribution of rash in a moderate case.



## EXPLANATION OF PLATE V

Showing effect of irritation. Note patches on inner side of left thigh above knee. This crop came out around a septic cut.

42a



EXPLANATION OF PLATE VI

Eighth day of rash. Left eye almost closed.





## EXPLANATION OF PLATE VII

Child born at full term with well developed rash.  
Mother vaccinated one month previous to birth of child.  
No history of illness in mother. Wassermann reactions of  
mother and child negative.

46a

